

SmartFarm: Turning Data Analytics into Farm Implements



Chandra Krintz

Professor

Dept. of Computer Science

UC Santa Barbara

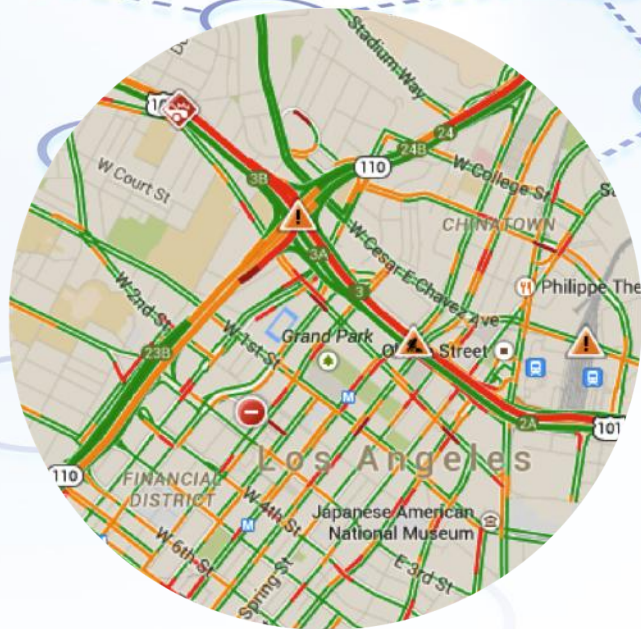


**CRA CCC 2017: Computing Research:
Addressing National Priorities
and Societal Needs**

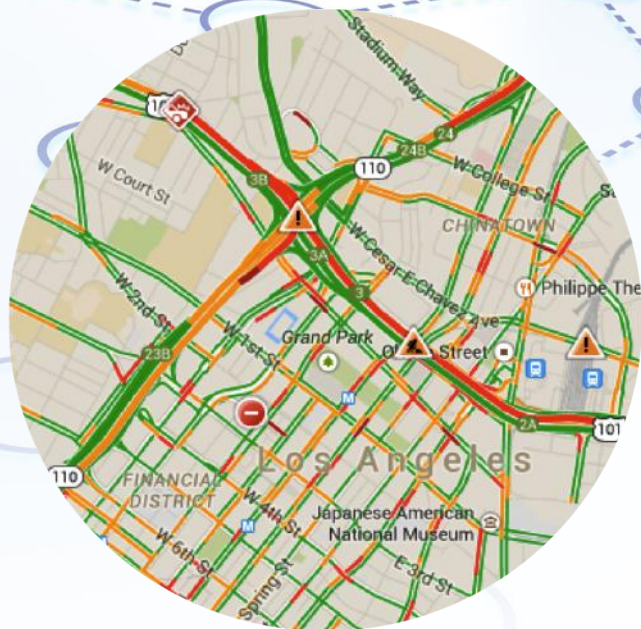


Oct. 23, 2017





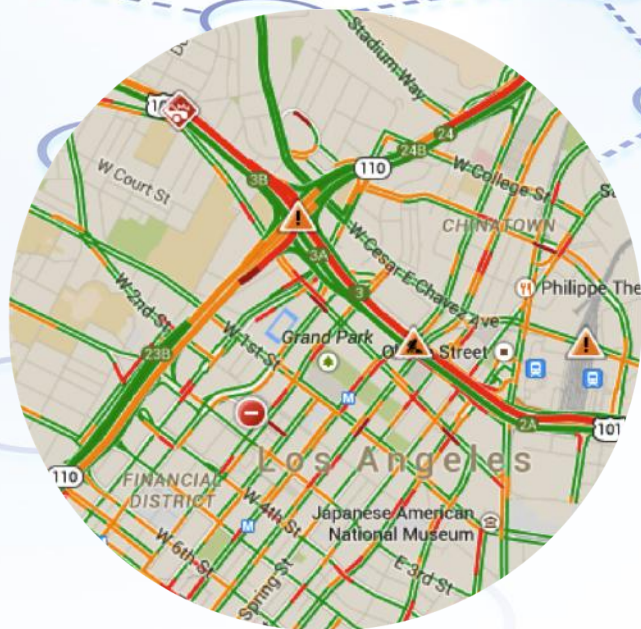
Google



Google



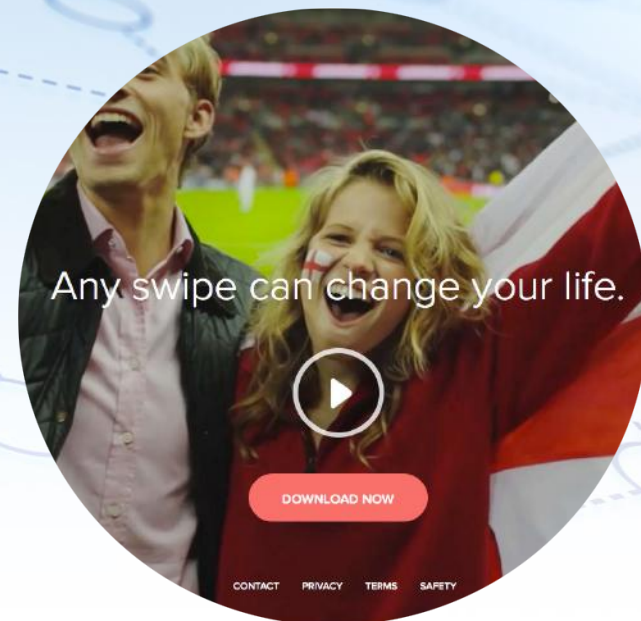
amazon®



Google



amazon®

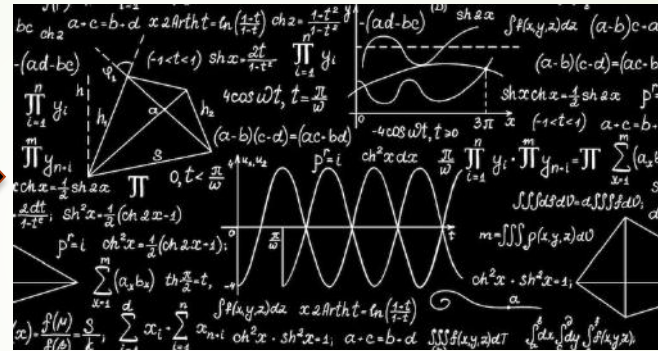


tinder™

Cloud + Data Analytics: Revolutionizing Commerce



Internet Activity



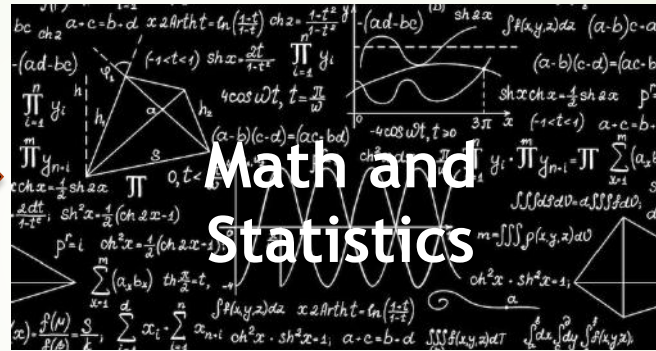
Inference and Prediction

- *What will you buy?*
- *When will you buy it?*
- *What will you pay?*

Cloud + Data Analytics: Revolutionizing Commerce



Internet Activity



Inference and Prediction

CODE!

- *What will you buy?*
- *When will you buy it?*
- *What will you pay?*

Our Research: What Else Can We Revolutionize With It?



Source: UN FAO

Our Research: What Else Can We Revolutionize With It?



**THE WORLD NEEDS MORE FOOD FOR A
GROWING POPULATION**

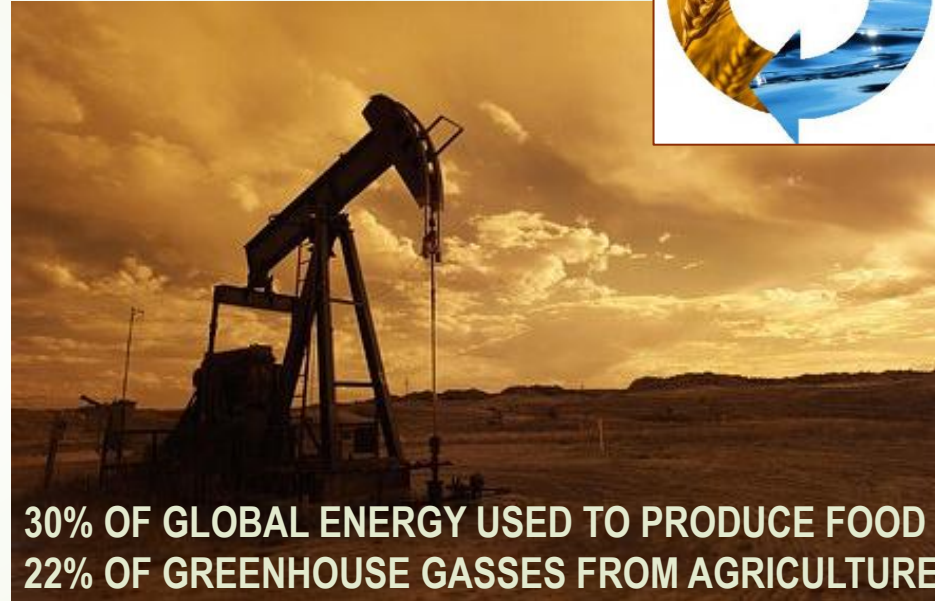
**BUT WE ALREADY USE 80% OF OUR FRESH
WATER FOR AGRICULTURE**

Source: UN FAO

Our Research: What Else Can We Revolutionize With It?



Source: UN FAO



Source: USDA

Our Research: What Else Can We Revolutionize With It?

THE WORLD NEEDS MORE FOOD FOR A GROWING POPULATION



**BUT WE ALREADY USE 80%
WATER FOR AGRICULTURE**

Source: UN FAO

**WE LOSE ALMOST HALF THE FOOD
WE PRODUCE TO SPOILAGE**



**ENERGY USED TO PRODUCE FOOD
HOUSE GASSES FROM AGRICULTURE**

Source: USDA



Source: UN FAO

The Opportunity



Data-Driven Decision Support & Automation



CODE!

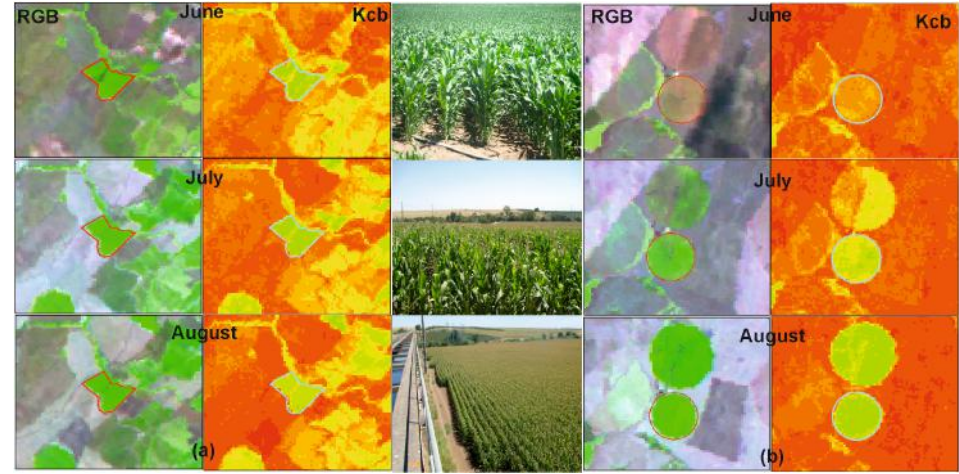
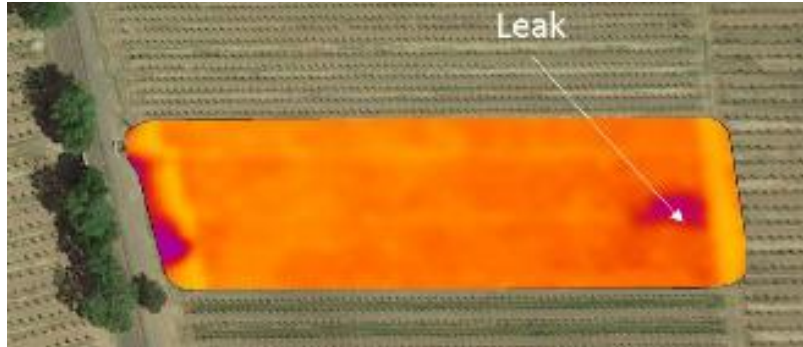
Inference and Prediction

- *What should I grow?*
- *When should I water?*
- *What will my yields be?*

Digital Infrastructure → Sustainable Agriculture Productivity



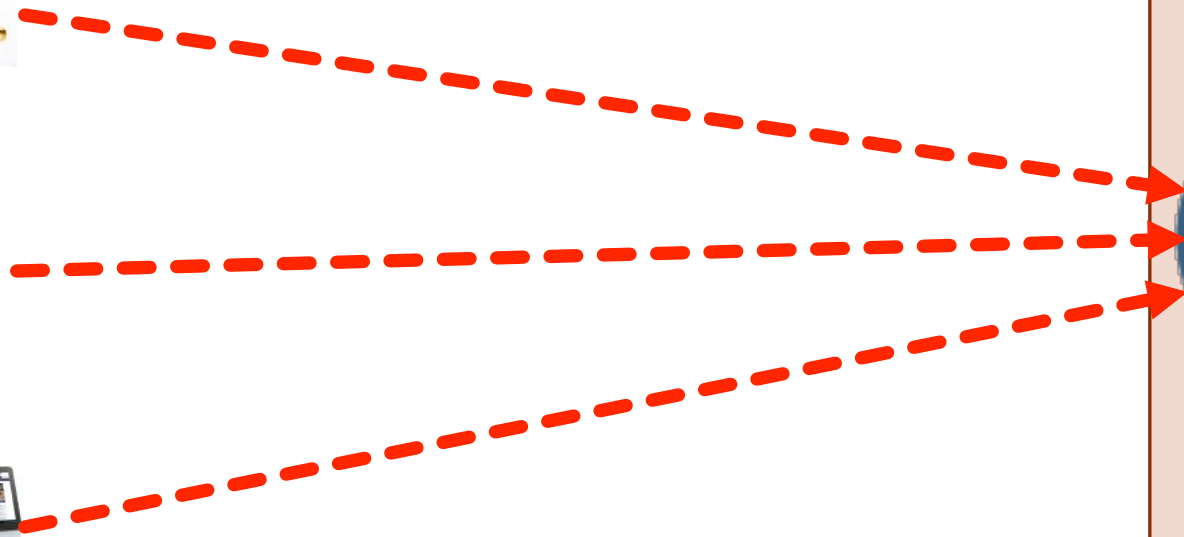
Digital Infrastructure → Sustainable Agriculture Productivity





Public Clouds

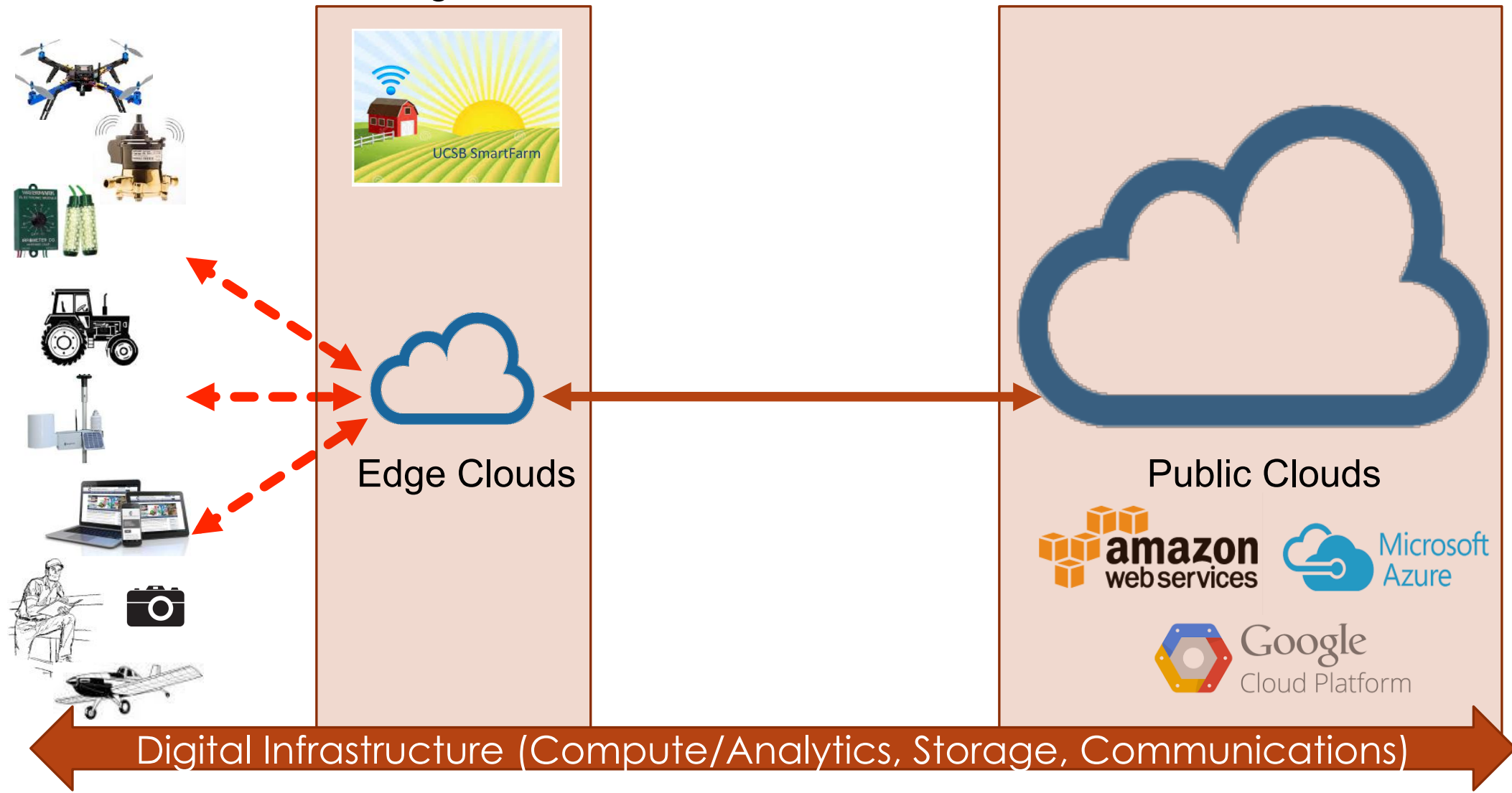




Devices

Edge Tier

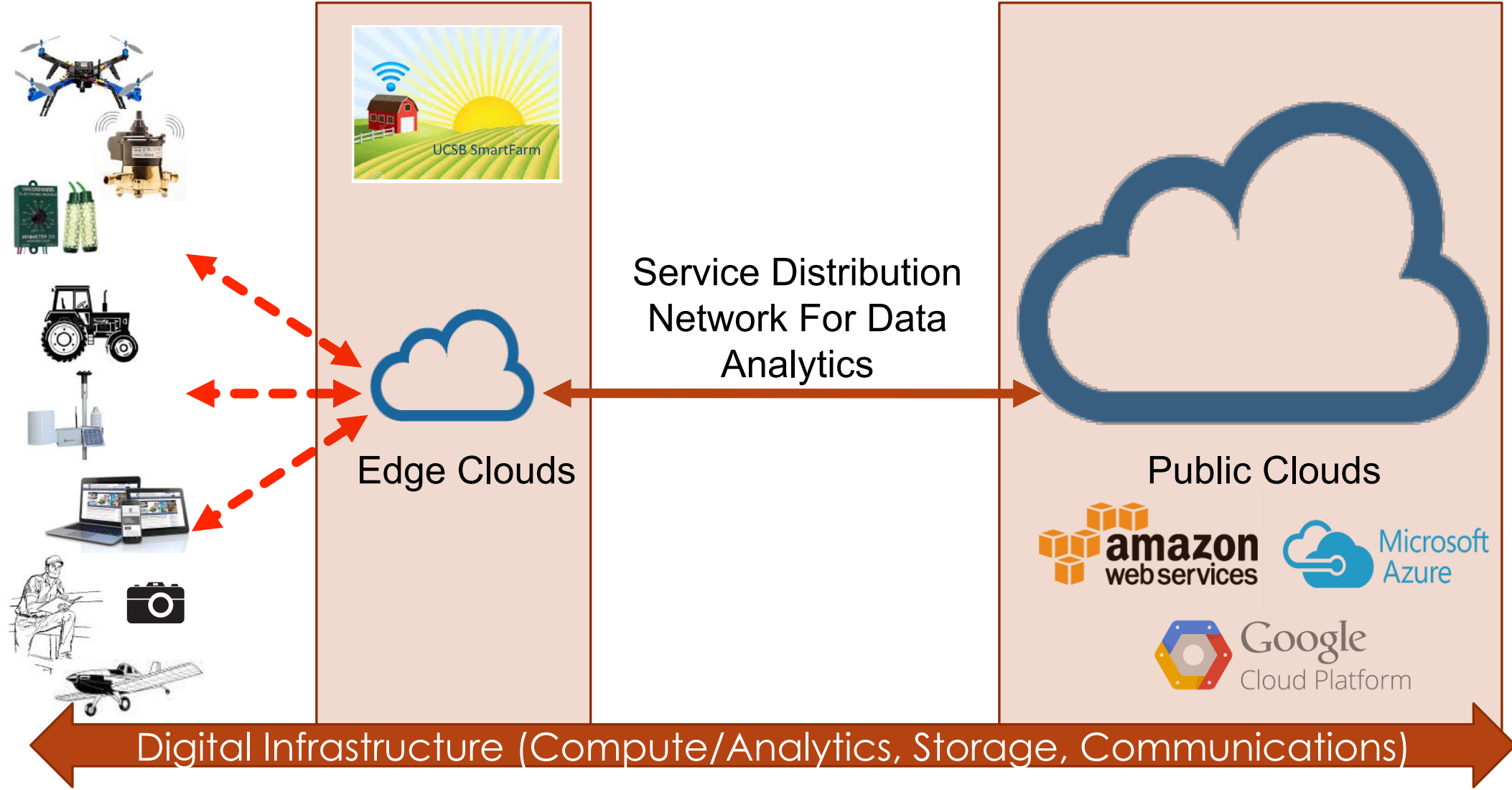
Public Cloud Tier



Devices

Edge Tier

Public Cloud Tier



Devices

Edge Tier

Regional Tier

Public Cloud Tier



Edge Clouds



Community Clouds



Public Clouds



Digital Infrastructure (Compute/Analytics, Storage, Communications)

Devices

Edge Tier

Regional Tier

Public Cloud Tier

Defining the Next-generation
Infrastructure for Things (I4T)



Edge Clouds



Community Clouds

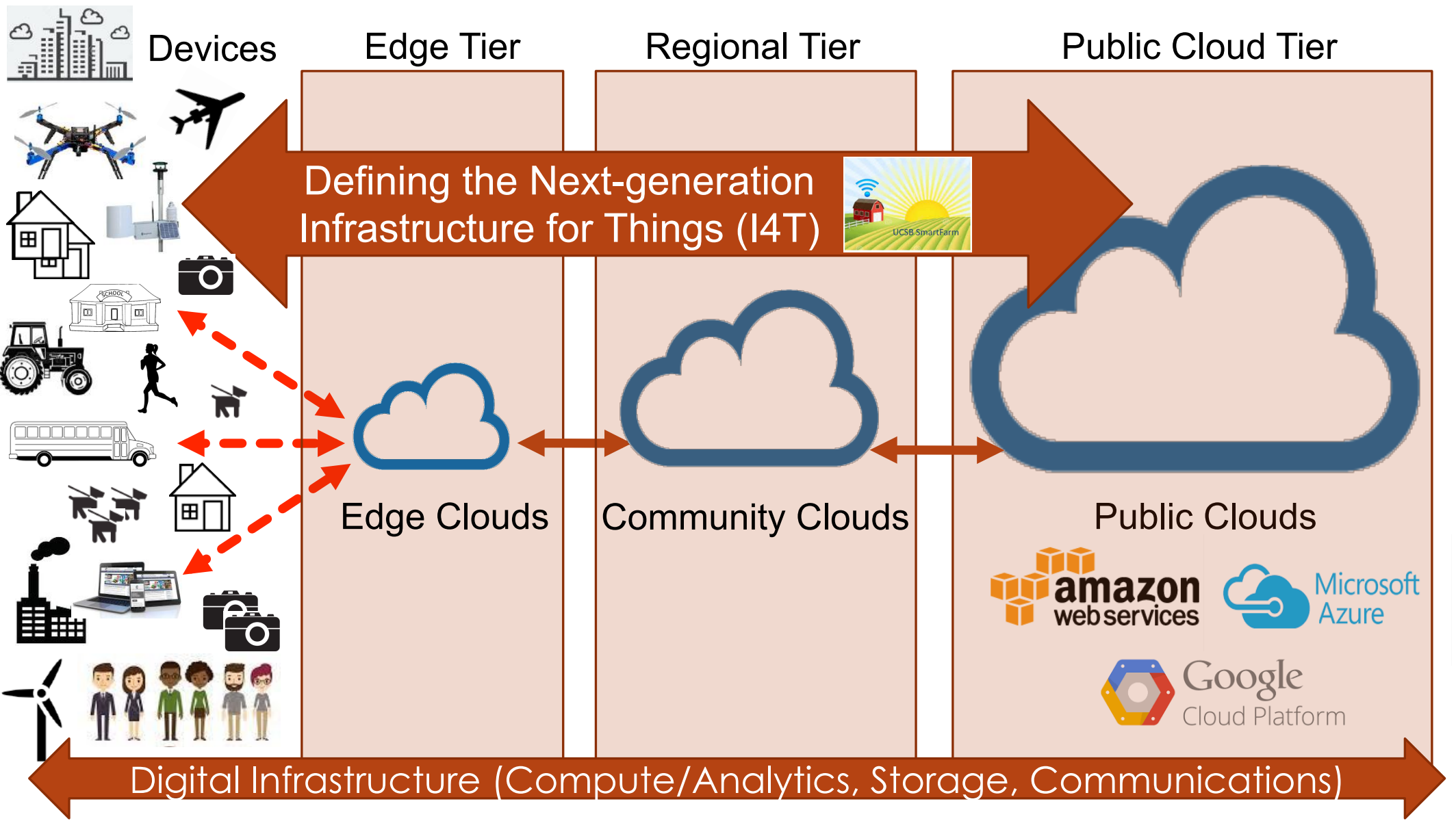


Public Clouds



Digital Infrastructure (Compute/Analytics, Storage, Communications)





A New Kind of Computer Science Research



- Problem driven and empirical
 - Food-Energy-Water nexus
- Societal and regional impact
- Multidisciplinary collaboration
- Leverages entrepreneurial activity
- Engages the community

Thanks!

UCSB RACELab

The Lab for Research on Adaptive Computing Environments
Computer Science Department, Harold Frank Hall (E-5), Santa Barbara, CA

- Collaborators: UCSB, CalPoly, UCDavis, Fresno State, Powwow Energy, Sedgwick Reserve, UC Extension, Private Growers
- Support: Google, Huawei, IBM Research, Microsoft Research, NSF, NIH, California Energy Commission

ckrintz@cs.ucsb.edu

<http://www.cs.ucsb.edu/~ckrintz/racelab.html>

Students



William Berman



Kyle Carson



Stratos Dimopoulos



Jonathan Eastern



Angad Gill



Nevena Golubovic



Wei-Tsung Lin



Benji Lampel



Kevin Malta



Andy Rosales Elias



Michael Zhang



Chandra Krintz



Rich Wolski